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ACT/ZA 2004/00131

Setifikaat

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Certificate

PATENT OFFICE

DEPARTMENT OF TRADE
AND INDUSTRY

Hiermee word gesertifiseer dat
This is to certify that

ACT/ZA 2004/00131

The attached documents are true copies of the Form P2, P1, P6 and a Provisional Specification of a South African Patent application No. 2003/08405

In the name of : **GRINAKER-LTA LIMITED**

Filed on the : **29TH OCTOBER 2003**

Entitled : **ROCK BOLT**

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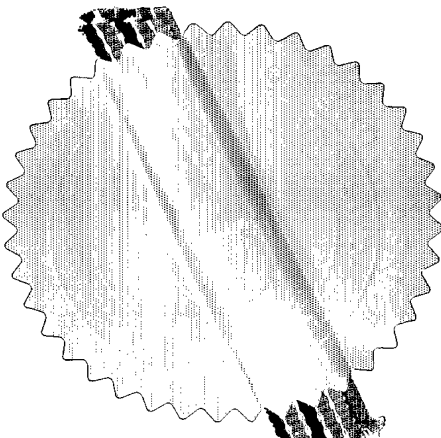
DECEMBER 2006

Signed at

in the Republic of South Africa, this

day of

Registrateur van Patente
Registrar of Patents



REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT

(Section 30(1) - Regulation 22)

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

Revenue Stamps or Revenue Franking
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OFFICIAL APPLICATION NO.

21 01 2003 / 8405

OFFICIAL DATE STAMP

FULL NAME(S) OF APPLICANT(S)

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ADDRESS(ES) OF APPLICANT(S)

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TITLE OF INVENTION

54 ROCK BOLT

Priority is claimed as set out on the accompanying Form P2.

The earliest priority claimed is: NONE

This application is a patent of addition to Patent Application No.

21 01

This application is a fresh application in terms of section 37 and based on Application No.

21 01

THIS APPLICATION IS ACCOMPANIED BY:

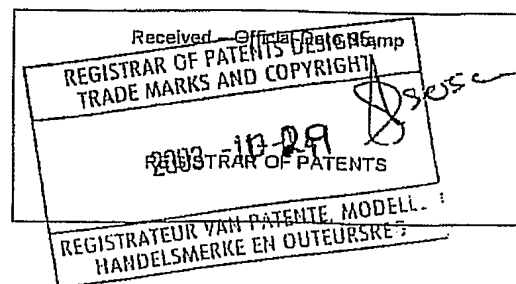
- ☒ 1 A single copy of a provisional specification of ...9... pages
- ☐ 2 Two copies of a complete specification of pages
- ☒ 3 ...4 ... Sheets of Informal Drawings
- ☐ 4 Sheets of Formal Drawings
- ☐ 5 Publication particulars and abstract (Form P8 in duplicate)
- ☐ 6 A copy of Figure of drawings (if any) for the abstract
- ☐ 7 Assignment of Invention
- ☐ 8 Certified priority document(s) Number(s)
- ☐ 9 Translation of priority document(s)
- ☐ 10 An assignment of priority rights
- ☐ 11 A copy of the Form P2 and the specification of SA Patent Application
- ☐ 12 A declaration and power of attorney on Form P3
- ☐ 13 Request for ante-dating on Form P4
- ☐ 14 Request for classification on Form P9
- ☒ 15 Form P2 in duplicate

21 01

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Dated 29 October 2003

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REPUBLIC OF SOUTH AFRICA				PATENTS ACT, 1978			
REGISTRAR OF PATENTS							
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Applicant(s) substituted:						Date Registered:	
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Assignee(s):						Date Registered:	
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Full name(s) of inventor(s)							
72 DAWE, Stephen George							
Priority claimed		Country		Number		Date	
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74 McCALLUM, RADEMEYER & FREIMOND, Maclyn House, 7 June Avenue, Bordeaux, Randburg • P.O. Box 1130, Randburg 2125							
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61							
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REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) - Regulation 27)

OFFICIAL APPLICATION NO

LODGING DATE

21	2003/08405
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22	29 October 2003
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FULL NAME(S) OF APPLICANT(S)

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FULL NAME(S) OF INVENTOR(S)

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TITLE OF INVENTION

54	ROCK BOLT
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BACKGROUND OF THE INVENTION

[0001] This invention relates to a rock bolt.

5 [0002] A friction-type rock bolt relies on friction which is generated between at least part of the bolt and a surrounding surface of a hole in which the rock bolt is located, to be effective. The effectiveness of the anchor, provided by the rock bolt, depends on the frictional force which is generated by the interaction of the bolt with the surrounding rock mass and on the length of the rock bolt which extends into solid rock, beyond the rock which is being supported by the rock bolt.

10 [0003] A mechanically-anchored bolt makes use of an expansion unit which is expanded, at one end of a shank, into close contact with a surrounding wall of a hole in which the rock bolt is inserted. At an opposing end the bolt has a washer connected to the shank, with the washer bearing on an outer surface of the rock face in which the hole is formed. The effectiveness of this type of anchor is dependent, at least, on the washer being in load-bearing contact with the rock face.

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[0004] Although friction-type bolts are relatively easy to install they are susceptible to corrosion and, as noted, the effectiveness of this type of bolt depends on the frictional force which is generated.

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SUMMARY OF INVENTION

[0005] The invention provides a rock bolt which includes an expandible tubular section and an expansion unit which is connected to the tubular section.

5 [0006] The tubular section may comprise an elongate tubular section which is radially expandible.

[0007] A valve may be connected to the tubular section and a pressurised fluid, eg. water, may be caused to pass through the valve into the interior of the tubular section to expand the tubular section.

10 [0008] The tubular section may be provided in a collapsed or non-expanded form wherein, in cross section, the tubular section includes a generally U-shaped outer portion and a smaller, generally U-shaped inner portion which is positioned at least partly inside the outer portion.

[0009] The valve may be connected to a first end of the tubular section.

15 [0010] A bearing plate or similar load-distributing appliance may be engaged with the tubular section preferably at a position at which the bearing plate abuts the valve collar structure which serves to retain the bearing plate engaged with the tubular section.

[0011] The tubular section may have a second end which is tapered.

[0012] The rock bolt may include a stud or shank which extends between the tubular section and the expansion unit.

5 [0013] The tapered second end may be attached or secured to the stud in any appropriate way. For example the tubular section may be swaged onto the stud or it may be welded to the stud or both techniques of attachment may be used.

10 [0014] The expansion unit may be of any suitable kind and preferably comprises a spring-loaded bail-type expansion unit which has a conical or wedge-shaped member connected to one end of the shank, a plurality of shells which abut an outer surface of the wedge member, a bail which is connected to the shells and a biasing member, such as a coil spring, which acts between the bail and the wedge member.

BRIEF DESCRIPTION OF THE DRAWINGS

15 [0015] The invention is further described by way of example with reference to the accompanying drawings in which:

Figure 1 is a side view of a rock bolt according to the invention;

Figure 2 is a perspective view on an enlarged scale of a portion of the rock bolt marked "2" in Figure 1;

20 Figure 3 is a side view on an enlarged scale of a portion of the rock bolt marked "3" in Figure 1;

Figure 4 is a perspective view from below of an end of the rock bolt marked "4" in Figure 1 in an assembled state;

Figure 5 is a view similar to Figure 4 but illustrating the same components in an exploded configuration; and

Figure 6 illustrates from a side and in cross section the rock bolt of the invention installed in a rock face.

5 DESCRIPTION OF PREFERRED EMBODIMENT

[0016] Figure 1 of the accompanying drawings illustrates a rock bolt 10 according to the invention which include a stud or shank 12 with a first end 14 and a second end 16.

10 [0017] An elongate tubular collar 18 is attached to the end 14. A bearing plate or load-distributing washer 20 abuts a valve collar 21 which is fixed to a free end of the tubular collar by welding.

[0018] An expansion unit 26 is attached to the second end 16 of the stud.

15 [0019] The stud 12 is of substantially conventional construction and has a diameter and length which are determined by the application. The first end 14 is formed with formations 30 which may be thread formations or similar peaks and troughs which provide a surface to which an end 32 of the collar can be swaged.

20 [0020] The collar is tubular, as is evident from an inset drawing in Figure 1. The inset drawing and Figure 4 show the construction of the collar in cross section. The collar has generally U-shaped outer portion 34 and a generally

U-shaped inner portion 36, which is smaller than the outer portion, located inside the outer portion. Over a substantial portion 40 of its length, see Figure 1, the tubular collar 18 has a constant cross section. The collar is tapered towards the end 32 so that it can be secured to the first end 14 of the stud by means of a swaging or similar process. In addition the collar is welded to the stud to ensure that these components are securely fixed to one another. At the same time the end 32 is sealed by welding.

[0021] The second end 16 of the stud 12 is threaded and is engaged in a threaded hole, not visible in Figure 2, which extends axially through a wedge- or conical-member 44 of the expansion unit 26. Three serrated shells 46 are positioned in tubular fashion around the wedge member and are connected to respective arms 48 of a bail 50. A coil spring 52 is positioned in an enclosure formed by the arms and extends between a base 54 of the bail and an opposing surface of the wedge member.

[0022] Lower ends 56 of the shells can be held together by means of a breakable tie, eg. of plastic or rubber, to ensure that the shells are retained in position during transport and storage.

[0023] The tubular collar 18 has a lower or second end 60 to which is attached the valve collar 21.

[0024] The valve collar 21 is tubular in cross-section and has an inner diameter 62 which is just large enough to pass over the tubular collar 18, and a flared end 64 to prevent the bearing plate 20 from travelling past the valve

collar. There is a hole 66 in the U-shaped outer portion 34 of the collar 18 to accept the valve 22.

5 [0025] The bearing plate 20 is made from a planar metal sheet 68 with a dome 70 which has a centrally positioned hole 72 into which the tubular collar 18 is inserted.

10 [0026] The valve 22 includes a valve body 76 with a hexagonal head 80. A passage, not visible in Figure 4, is formed through the body and one end terminates in a hole 82 in the head. A ball 84 and a spring 86 are positioned in the passage and a retaining screw 88, which is engageable with a complementary threaded formation inside the passage, acts on the spring to bias the ball to seal the hole. The valve is therefore of a substantially conventional nature in that it acts as a one-way filling valve. The valve body 76 is positioned over the hole 66 whereafter the valve body is welded to the outer surface of the outer portion. In this way the passage inside the body is placed in communication with the interior of the tubular collar.

20 [0027] The lower end 60 of the tubular collar is shown in Figures 4 and 5. When the valve collar 21 is welded to the tubular collar, the end 60 is sealed by means of the welding. As both ends of the tubular collar (ie. the ends 32 and 60) are sealed by welding, the interior of the tubular collar is a sealed enclosure and access to the enclosure is only possible through the valve body.

[0028] Figure 6 illustrates the rock bolt 10 installed in a hole 90 which is drilled into a rock body 92 from a rock face 94. The rock bolt is pushed into the hole so that an inner surface 96 of the bearing plate 20 bears on the rock face 94.

5 [0029] The expansion unit 26 is actuated simply by twisting and pulling slightly on the end of the rock bolt which protrudes from the hole 90. This causes the unit to expand into load-bearing contact with the wall of the hole 90. Thereafter a pressurised source of water is connected to the valve 22. The valve body 76 is of a conventional design so that it can be used with
10 existing water pumps and connectors.

[0030] When the interior of the tubular collar 18 is pressurised it expands radially into contact with an opposing surface 100 of the hole 90. At the time of installation therefore the rock bolt is anchored mechanically by means of the expansion unit 26 and frictionally by means of the inflated tubular collar.
15 The mechanical anchor 26 is clearly not dependent on frictional effects, as is the case with conventional friction-anchored bolts, to exhibit its load-bearing characteristics. On the other hand the inflated tubular collar 18 bonds frictionally to the rock surface 100 adjacent the mouth of the hole and thereby reduces reliance on the load-bearing washer 20. The rock bolt is totally
20 mechanical in operation and does not require grout or resin.

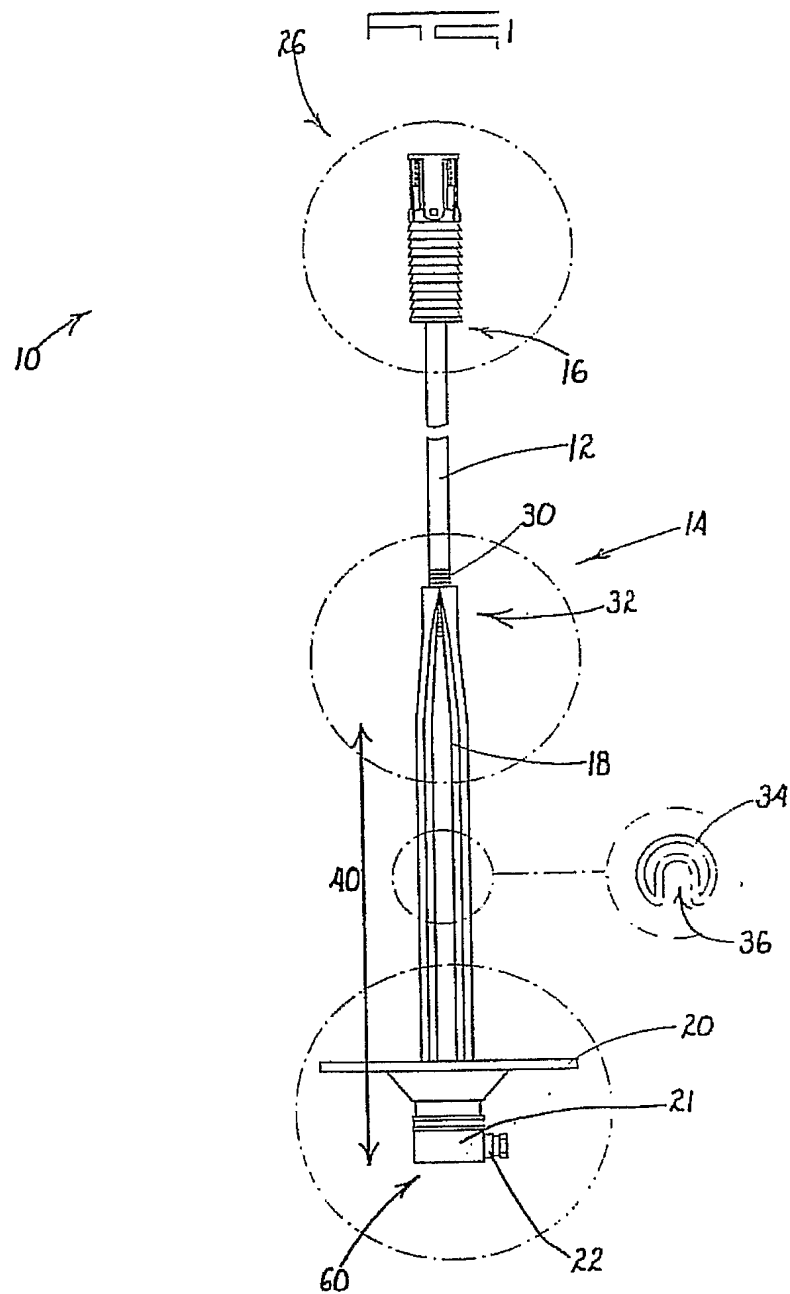
[0031] Most of the components used in the rock bolt of the invention are standard components and can be manufactured using existing technology. It

is possible to incorporate a pop-out pressure indicator in the valve or on the tubular collar which allows for post-installation insulation quality checks.

Dated this 29th day of October 2003.

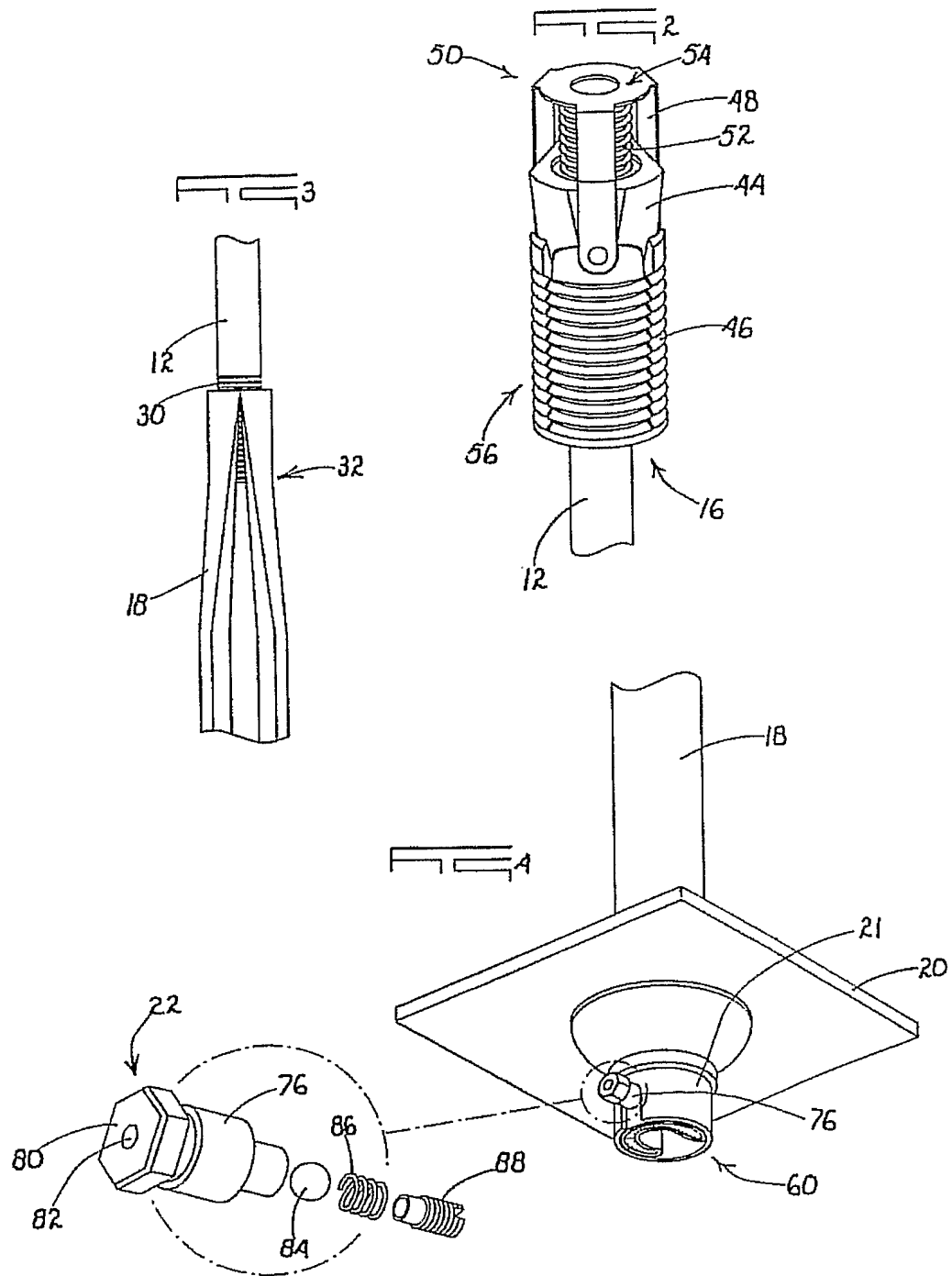
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GRINAKE-LTA LIMITED
PROVISIONAL PATENT APPLICATION



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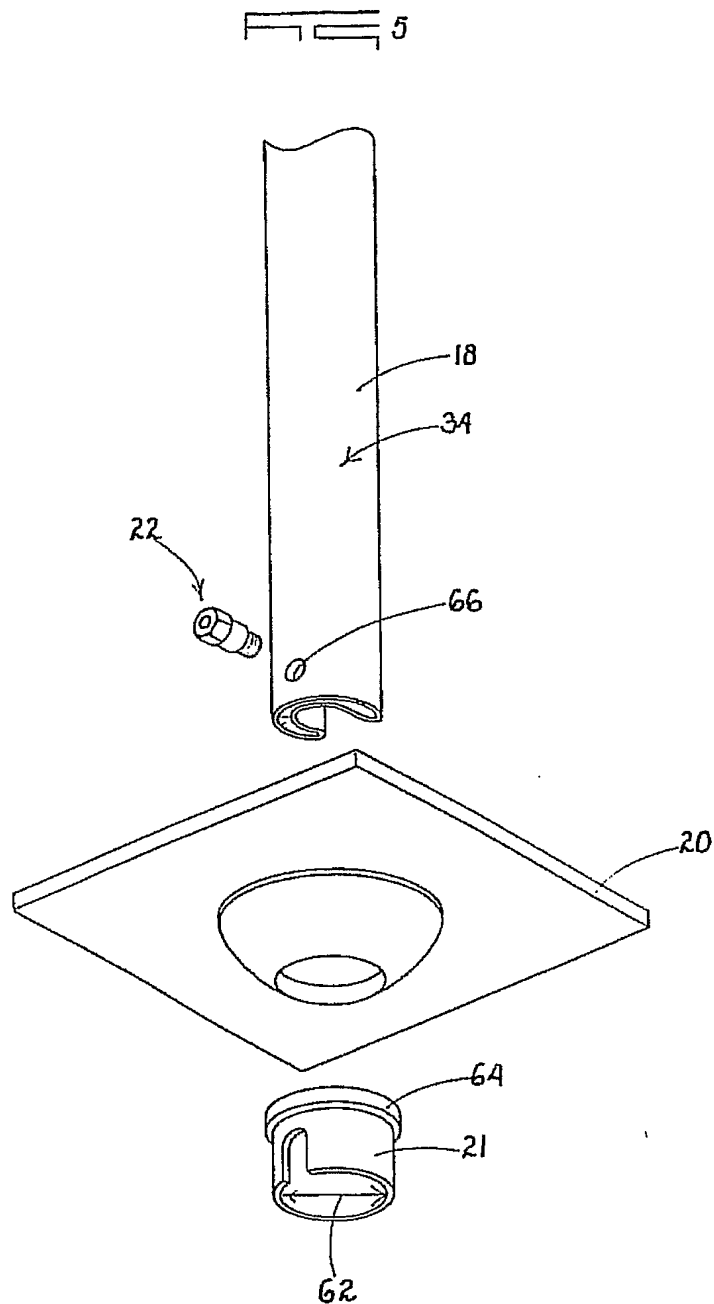
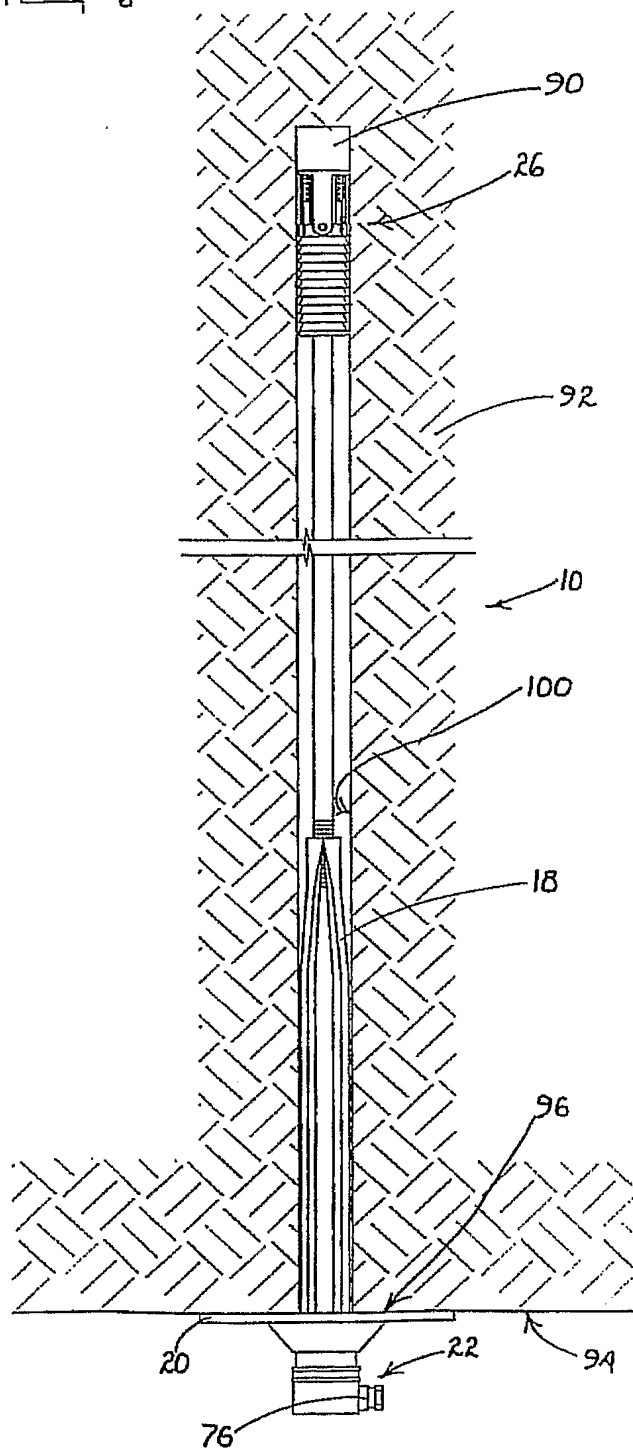


FIG 6



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